International Review of Economics and Finance 48 (2017) 69–82

Contents lists available at ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref

Exchange rate pass through, cost channel to monetary policy transmission, adaptive learning, and the price puzzle

Syed Zahid Ali[a,*], Sajid Anwar[b,c,d]

[a] School of Economics, Lahore University of Management Sciences, Lahore, Pakistan
[b] School of Business, University of the Sunshine Coast, Maroochydore DC, QLD 4558, Australia
[c] School of Commerce, University of South Australia, Adelaide, SA 8001, Australia
[d] Shanghai Lixin University of Accounting and Finance, Songjiang District, Shanghai, China

ARTICLE INFO

JEL classification:
E31
E32
E52

Keywords:
Learning
Exchange rate pass through
Price puzzle
Cost channel
Calvo rule
Optimal monetary policy

ABSTRACT

Using a New Keynesian open economy model, where the supply side effects of the exchange rate pass through as well as the cost channel of monetary policy transmission are taken into account, this paper evaluates the possibility of the price puzzle, which refers to anomalous behavior of inflation to a monetary shock. Unlike the existing studies, we consider the possibility of the price puzzle when agent expectations are based on adaptive learning and three monetary policy alternatives (the optimal monetary policy, money growth targeting, and a Calvo-type policy rule) are available to the central bank. Furthermore, we use two alternative measures of inflation. Calibration of our medium scale model, using plausible parameter values, reveals that irrespective of how the inflation rate is measured and the policy rule used by the central bank, the puzzle fades away when a sufficiently strong exchange rate pass through is present in the economy. We also find that a decrease in inflation is associated with a cost to the society in the form of lower aggregate output but this loss is minimum when the central bank uses the optimal monetary policy.

1. Introduction

Central Banks around the globe tend to use a high interest rate policy to control the rate of inflation. However, a number of empirical studies found that an increase in the US Federal Funds Rate increases (rather than decreasing) the inflation rate. This unexpected result is known as the price puzzle (Eichenbaum, 1992). Theoretically speaking, an increase in the nominal interest rate decreases the aggregate demand, which depresses the upward price momentum. However, two possibilities might plague the expected negative correlation between the interest rate and prices. First, an increase in the nominal interest rate may result in a decrease in the real interest rate, which increases the demand for goods and services thereby increasing the rate of inflation.[1] The other possibility is that a cost channel of monetary policy transmission exists. If firms borrow money to finance the cost of production, the marginal cost of production, as indicated by Ravenna and Walsh (2006), among others, is affected by the interest rate. In such a case, a contractionary monetary policy shock increases the marginal cost of production, which contributes to an increase in the prices of goods and services, thereby increasing the rate of inflation. Within the context of the price puzzle, a number of studies have examined the role of the cost channel. However, relatively few existing studies have focused on the role of exchange rate pass

* Corresponding author.
E-mail addresses: szahid@lums.edu.pk (S.Z. Ali), SAnwar@usc.edu.au (S. Anwar).

[1] The impact of inflationary expectations on the real interest rate is related to the Keynesian assertion that increased price flexibility may be destabilizing. For a detailed analysis of this issue, please refer to Scarth (2014, p. 29–34).

http://dx.doi.org/10.1016/j.iref.2016.11.010
Received 17 February 2016; Received in revised form 18 November 2016; Accepted 21 November 2016
Available online 23 November 2016

through, which is defined as the effect of exchange rate changes on the rate of inflation.

Studies that highlight the role of exchange rate pass through in real economies include Devereux and Engel (2003), Benigno and Benigno (2003), Sutherland (2005a, 2005b). These studies show that, in the case of an incomplete exchange rate pass through, the exchange rate volatility can have a direct impact on consumer welfare and hence the optimal monetary policy must take into account the exchange rate volatility. A number of studies have examined the role of exchange rate pass through in the context of imported input prices.[2] However, only a few studies (for example see Bachetta and van Wincoop, 2003; Gagnon & Ihrig, 2004; Campa & Goldberg, 2006; and Takhtamanova, 2010) focus on the relationship between exchange rate pass through and the aggregate price indices. Using a small scale dynamic stochastic general equilibrium (DSGE) model where agent expectations are formed rationally, the theoretical predictions of Ali and Anwar (2016) suggest that exchange rate pass through can play a vital role in determining the direction of the correlation between the interest rate and inflation.

Using a medium scale DSGE model, where three types of monetary policy alternatives are available and agent expectations are based on adaptive learning, we argue that a contractionary monetary policy that leads to exchange rate appreciation can put a downward pressure on domestic prices due to exchange rate pass through. At the same time, owing to the cost channel of monetary policy, the increase in the interest rate also increases the cost of production, which puts an upward pressure on domestic prices. As the interest rate has both negative and positive effects on the cost of production, its net effect on cost push inflation is ambiguous. Inflation may increase, if the interest rate effect dominates the exchange rate effect and vice-versa. We consider two alternative measures of inflation: (i) the consumer price index based inflation rate and (ii) the general price index (which includes only domestically produced goods) based inflation rate. We refer to the second measure as the domestic inflation rate. Another distinguishing feature of this paper is that, we consider three alternative monetary policy rules: (i) the optimal monetary policy, (ii) money growth targeting, and (iii) a Calvo-type interest rate rule. This allows us to establish the robustness of our main result.

In this paper, we do not rely on the assumption of rational expectations, which is based on the idea that agents know the structure of the economy as well as the values of some key economic model parameters. Evans and Honkapohja (2001), among others, argue that even the trained economists do not have prior knowledge of the values of economic model parameters. Economists tend to use historical data to estimate the relevant parameters. Milani (2007), among others, argues that DSGE models based on the assumption of rational expectations cannot mimic the persistence of aggregate output and inflation in particular. Millani showed that DGSE models based on adaptive learning can outperform the models based on rational expectations. Prior to Millani's study, Bullard and Eusepi (2005), Cogley and Sargent (2005), among others, used the idea of adaptive learning to examine the post-war evolution of the US inflation and monetary policy. They concluded that models based on learning are helpful in understanding certain historical episodes that were harder to explain by means of model that are based on the idea of rational expectations. In summary, adaptive learning has emerged as an alternative to the idea of rational expectations. In the case of adaptive learning, economic agents are assumed to making use of an econometric model to forecast the future values of economic variables. As the new information becomes available, agents revise their expectations formation (or forecasting) rules. Agents learn through their experiences concerning the seriousness of the central bank in controlling the rate of inflation and go along with the plan of the central bank. In short, in the case of adaptive learning, the job of the central bank becomes much easier as there are no misgivings on the part of economic agents.

Due to the assumption of adaptive learning, it is not possible to derive analytical results and hence, using plausible parameter values, we resort to model calibration. Calibration of our medium scale DSGE model confirms that the cost channel of monetary policy is a necessary condition for price puzzle to occur under all three monetary policy alternatives. Furthermore, we find that some degree of exchange rate pass through is necessary to resolve the puzzle. Another very interesting finding of our model is that, in the presence of a moderate degree of exchange rate pass through, the consumer price index (CPI) based inflation (which takes fluctuations in the prices of the imported goods and services into account) falls but domestic inflation (which excludes the direct effect of the exchange rate on inflation and which is measured by a general price index) continues to increase under all three monetary policy alternatives. However, in the presence of a strong exchange rate pass through, even the domestic inflation falls.

The rest of this paper is organized as follows. A brief literature review is provided in Section 2. Section 3 contains a description of our New Keynesian open economy model. Simulation results are presented and discussed in Section 4. Section 5 concludes the paper.

2. Related literature

The literature on price puzzle, which is an empirical phenomenon, can be divided into a few categories as follows:

2.1. VAR/SVAR-based studies

Using a vector autoregressive (VAR) approach, Sims (1992) found that an increase in the interest rate leads to increase in inflation in several industrialized economies. Sims found that the extent of the price puzzle decreases, if we use the index of goods prices as a proxy for inflation. Sims suggested that the central bank should consider using an 'information variable' to determine the rate of inflation and then react preemptively.[3]Hanson (2004), while using Bernanke and Mihov (1998) model to re-examine the price puzzle, reported that over the years the extent of the price puzzle has decreased but it continues to inhabit in monthly data. Using quarterly

[2] For example, see Junttila and Korhonen (2012), Choudhri and Hakura (2015) and Kiliç (2016).

[3] Prior to Sims (1992), using a theoretical model, Sargent and Wallace (1981) showed that when public debt is high and the real rate of return on government securities exceeds the growth rate of the economy, a tight monetary policy (in the form of a low growth rate of money supply) can result in higher inflation.